

Textbox A.1. The structured representation of the key entities and relationships involved in the proposed semantic OWL ontology, facilitating effective knowledge representation and reasoning about user behaviors, preferences, and goals.

Classes and sub-classes:

- User
- UserProfile
- Preferences
 - Goal-Settings
 - InteractionType
 - ResponseType
- LifestyleParameters
- Routine
- LocationSpecific
- LocationName
 - Weather
 - Longitude
 - Latitude
- TemporalEntity
 - Time_(hh:mm:ss)
 - Date
- Sleep
- Habit
 - Alcohol_consumption
 - Tobacco_consumption
- Activity
- Diet
 - Water_consumption
- Recommendation
 - ActivityRecommendation
 - DietaryRecommendation
 - HabitualRecommendation
 - SleepRecommendation
- RecommendationMessage
 - MessageBody
 - MessageIntent
- Intensity
- CalorieRestriction
- Duration
- Equipment
 - Measurement_type
 - Measurement_value
 - Name
- FoodType
 - Alcoholic_beverages
 - Discretionary_foods
 - Energy_drinks
 - Fruit_drinks
 - Fruits
 - Milk-based_coffee_drinks
 - Soft_drinks
 - Vegetables_salads
- Frequency
 - Count
 - Question
 - Message

- Response_chatbot
- Sentiment

Properties (Domain, Range):

- hasProfile (User, UserProfile)
- hasPreferences (User, Preferences)
- hasParameters (User, LifestyleParameters)
- hasActivity (LifestyleParameters, Activity)
- hasDiet (LifestyleParameters, Diet)
- hasHabit (LifestyleParameters, Habit)
- hasSleep (LifestyleParameters, Sleep)
- hasCalorieRestriction (Diet, CalorieRestriction)
- hasDuration (Activity, Duration)
- hasDuration (Sleep, Duration)
- hasDuration (Habit, Duration)
- hasEquipment (Activity, Equipment)
- hasFoodType (Diet, FoodType)
- hasFrequency (User, Frequency)
- hasLocation (User, LocationSpecific)
- hasRecommendation (User, Recommendation)
- hasMessage (Recommendation, RecommendationMessage)
- hasRoutine (User, Routine)
- hasTemporalEntity (Activity, TemporalEntity)
- hasTemporalEntity (Diet, TemporalEntity)
- hasTemporalEntity (Habit, TemporalEntity)
- hasTemporalEntity (Sleep, TemporalEntity)
- hasTemporalEntity (Recommendation, TemporalEntity)

Relationships and Usage:

- The *User* class is the central entity that has relationships with different aspects of *LifestyleFactors* such as *Activity*, *Sleep*, *Diet*, and *Habit*.
- Each *User* has its own location information (e.g., *LocationSpecific*).
- The *UserProfile* class stores user-specific information including health data.
- *Preferences* influence the selection of specific activities, diets, and habits, goals, interaction type and response types.
- The *Activity* class includes properties like intensity, duration and frequency of physical activity and details of equipment for measurement.
- The *Diet* class includes properties related to food types and caloric restrictions.
- The *Sleep* class includes properties related to sleep duration.
- The *Habit* class includes properties related to alcoholic and tobacco consumption with duration.
- Different levels of intensity, frequency, food types, routines, durations, etc., are represented by separate classes with specific properties.
- The *Frequency* class includes chatbot interactions.
- The *Recommendation* class includes different categories of recommendation messages.
- The *RecommendationMessage* class includes intent and bodies of the recommendation messages.
- The *TemporalEntity* class includes date and time.